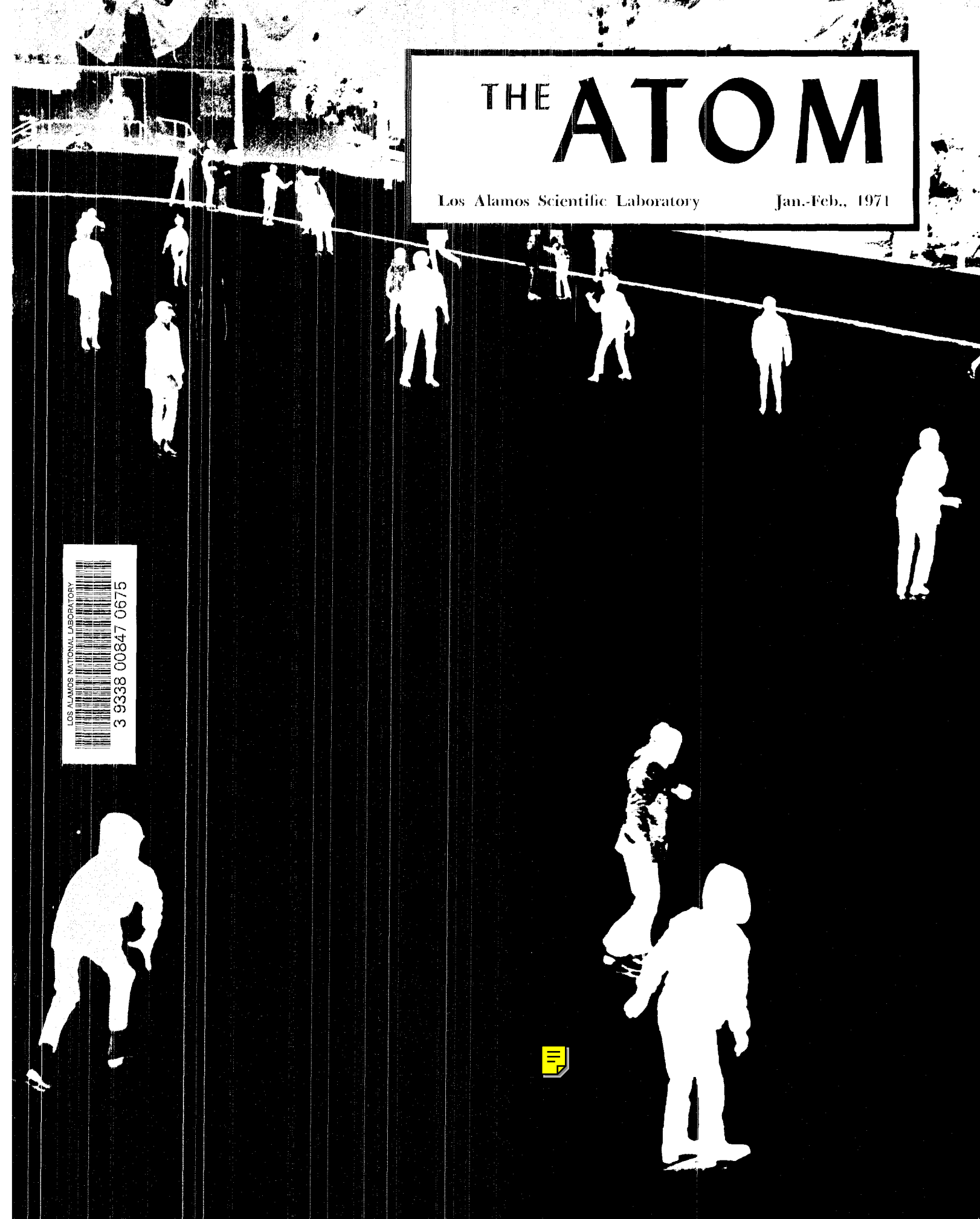

THE ATOM

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COVER:
The cover photo, taken by Bill Jack Rodgers, ISD-7, shows ice skating to be a popular winter sport in Los Alamos. Rodgers took several others which are combined in a photo feature beginning on page 16.

Top, charting simulated fallout are Bill Kennedy, H-6 group leader; Harvey Israel and Ed Bemis, both H-1; and Ralph Jennings, H-6. Upper left, Sue Wooten, ISD-2, prepares to serve water and survival crackers. At upper right is Robert Porton, civil defense director. Above are some members of the Control Group. Seated are H. Jack Blackwell, manager of the AEC's Los Alamos Area Office; Porton; Harold Agnew, LASL director; and Earl Wise, ENG-5 assistant group leader. Standing are Raemer Schreiber, LASL technical associate director, and Roderick Spence, N-division leader.

Mechanics of an Emergency

Key officials of the Los Alamos Civil Defense organization completed a readiness test exercise last month designed to point out any weaknesses in the local civil defense plan.

According to Los Alamos Civil Defense Director Robert Porton, it was the first exercise of its kind to be conducted in the Hill city. "We have been firmly established for many years, but the people involved have never had the opportunity to sit down together and go through the mechanics of a civil defense emergency as if it were the real thing," he said.

The exercise was conducted by the University of New Mexico Extension Division with the assistance of the State Civil Defense Office. Heading the three-member team from the University, which is funded by the Department of Defense to conduct exercises in New Mexico, was Verle Simpkins. He was assisted by Harry Crespy and Ted Tedesco. Colonel E. J. Hamilton, state coordinator for civil defense, headed the state contingent which consisted of Lieutenant Colonel T. C. Closson, Carl Womack, and Colonel Bill Reeves.

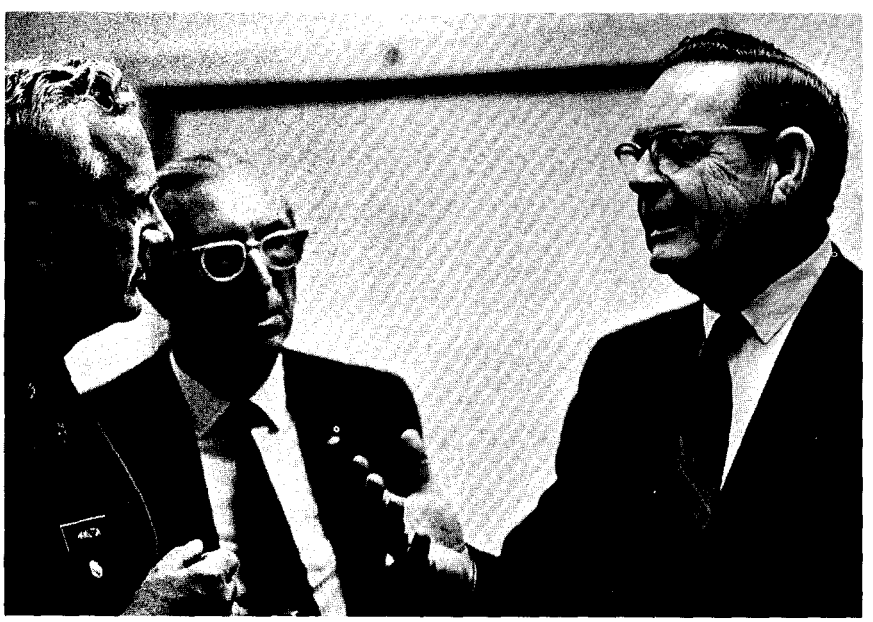
Other out-of-town civil defense officials present for the exercise were Gaines West, Denton, Texas, Region 5 acting deputy director, and Owen Payne, Region 5 field officer assigned to the State of New Mexico. Region 5 consists of the states of New Mexico, Oklahoma, Texas, Arkansas and Louisiana.

The exercise was held in the Emergency Operations Center in the basement of "Station 100," former headquarters of the AEC's Protective Force at the Los Alamos Scientific Laboratory. More than 50 persons crowded into the small facility each day to participate in the exercise. Over the three-day period a total of 88 persons participated.

In the facility's anteroom were weather maps and charts on which civil defense weathermen and radiological officers kept track of current weather

continued on page 3

Above, Harry Crespy, University of New Mexico, reminds simulators of the next problem to be fed to the Central Control Group. At center, standing, is Carl Womack of the State Office of Civil Defense, and Verle Simpkins, head of the University team. Seated are simulators Carl Buckland, H-1, and Bob Drake, GMX assistant division leader.



Discussing the civil defense exercise are Colonel E. J. Hamilton, state coordinator for civil defense; Owen Payne, Region 5 field officer; and Gaines West, Region 5 acting deputy director.

leader, Harvey Israel and Ed Bemis, both of H-1, conditions, wind directions and velocities, and radiological reports. Working in the anteroom were weathermen Bill Kennedy, H-6 group Ralph Jennings, H-6, and radiological officers Jim Lawrence, associate H-1 group leader, and Charles Blackwell and Carl Buckland, both of H-1.

Just off the anteroom, seated around a table in a small office, were members of the Civil Defense organization's Central Control Group, the county's governing body during an emergency such as was being simulated during the readiness test exercise. The group, headed by Porton, included Laboratory Director Harold Agnew; Manager of the Atomic Energy Commission's Los Alamos Area Office, H. Jack Blackwell; Zia Company Manager Wendell Miller; and then County Commission Chairman Delbert Sundberg. Around the perimeter of this room were alternate members who took their turns at reacting to emergency situations simulated during the exercise. Radio Station KRSN, which would be the public's communications link with the civil defense organization during an emergency, was also utilized by giving its vital messages over a loudspeaker system.

In another room adjacent to the Central Control Group were the shelter managers and their alternates, headed by the troika of Wright Langham, assistant H-division leader for biomedical research; Robert Drake, assistant GMX-division leader; and Frank Tallmadge, P-DO.

In a room across a corridor from the Central Control Group and the shelter managers was a team of simulators which made up the problems with which the Central Control Group and the shelter managers would be confronted during the exercise. A sign on the door of this room, "Off Limits to Members of the Central Control Group," was a frank reminder that the problems would be a surprise to Porton's group.

The team of simulators was headed by Roy Reider, H-3 group leader. Other members were Albro Rile, Los Alamos fire marshal; Drake, borrowed from the shelter managers' troika; Mayo Pacheco, Los Alamos County; Dean Miller, Zia Company; Buckland, who also served as a radiological officer during the exercise; and Kenneth Sierecki, H-3, who was Reider's alternate.

The team prepared the problems for the exercise the week before. They were given additional assistance in planning by four consultants--Bob Ullrich of the Los Alamos Police Department; Dr. Ann Wadstrom and Dr. Michael Stewart of the

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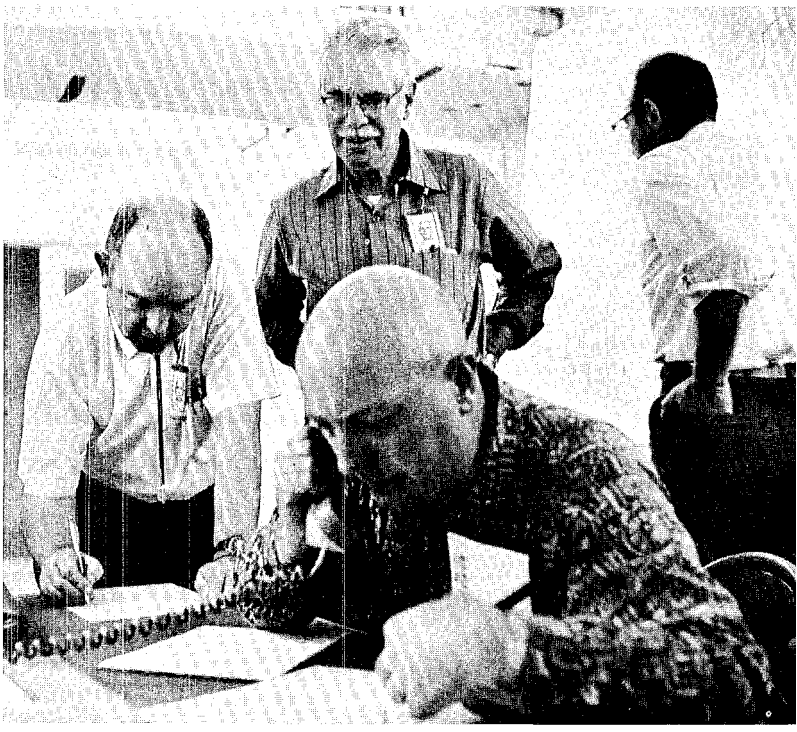


Radiological Officer Jim Lawrence, associate H-1 group leader, receives fallout information via telephone. Behind him are weathermen Kennedy, Israel and Jennings.

Los Alamos Medical Center; and Tallmadge, a member of the shelter managers' troika.

The problems prepared by Reider's simulators and consultants were reviewed by Director Simpkins and his University team to insure realism. Then they were fed to members of the Central Control Group on a predetermined time schedule with all the rapidity and realism of an actual emergency situation. Coordinating communications for the exercise was Earl Wise, ENG-5 assistant group leader.

A true emergency of the type being simulated during the exercise would have had a time span of more than a month. But, for the purposes of this rehearsal, days were transformed into minutes and it was completed in three two-hour sessions.

Each session represented one phase of the emergency situation. The first phase was "Increased Readiness." The situation as described by Simpkins was a period of increasing international tension that could likely lead to a nuclear strike against the United States. During this phase the Central Control Group took action necessary to prepare the community for possible shelter occupancy. This included shelter inspections, testing warning whistles, inventorying foodstuffs, drugs, equipment of all types, and making certain teams of volunteers knew the tasks they would have to perform should an emergency be declared. During the process of carrying out these activities, Reider and his team of simulators made sure that preparations ordered by the Control Group did not run smoothly.

The Second phase was "The Attack." University officials started the session off by noting that a misguided enemy missile had detonated 70 miles

east of Farmington, and that fallout from the nuclear strike would reach Los Alamos in one hour.

During this session families were ordered to report to their assigned shelters. Again the simulators posed problems such as traffic accidents, people reporting to shelters other than those to which they were assigned, people from other communities seeking shelter in Los Alamos, a malfunctioning air supply system in one of the shelters, and other similar problems.

Phase three was "Post-Attack." This session started near the end of the shelter-occupancy period when food, water and medical supplies were diminishing and the anxieties of occupants who were separated from other members of their families had peaked. Others who were tired of crowded conditions in the shelters wanted to leave, a flu epidemic had broken out in one of the shelters, fires were reported in the town and at the Laboratory, and looting was taking place by some people who had emerged early from home shelters. These and other obstacles were posed by the team of simulators.

In addition to overcoming these problems, the Central Control group, in this final phase of the exercise, had to determine the order in which people would leave their shelters, personal needs that people should satisfy immediately after their release, resupplying the shelters if necessary, reorganizing county government, rationing food supplies, water, drugs, fuel and automotive gasoline, and starting programs to expedite recovery with outside assistance where possible.

After the exercise was brought to a conclusion, Colonel Hamilton pointed out that it was not a stereotype of others conducted in the state because members of the Los Alamos Civil Defense organization were more knowledgeable in nuclear matters than in other counties of the state. "We have observed many exercises, but we have never seen this type of participation in any other county yet. We are pleased with your reactions and with the realism of the exercise," he said.

Above, headed by Roy Reider, H-3 group leader, right, the simulators fed problems to the Central Control Group with all the rapidity and realism of an actual emergency.

Below, in the shelter managers room, Wright Langham, assistant H-division leader for biomedical research and a member of the troika which heads the shelter managers, second from left, discusses a problem with Harlan Averitt, WSD assistant administrator, left, John Buchen, CMB-7 assistant group leader, and Frank Hauser, GMX-3 assistant group leader.

Left, members of the Central Control Group listen to a problem solution offered by Blackwell, right foreground.

A Boon to Plowshare

Ever since the Los Alamos Scientific Laboratory's first involvement in the Plowshare Program—the Atomic Energy Commission's endeavor to investigate and develop peaceful uses for nuclear explosives—the Laboratory has been working on the technology that will be required in the program's future experiments.

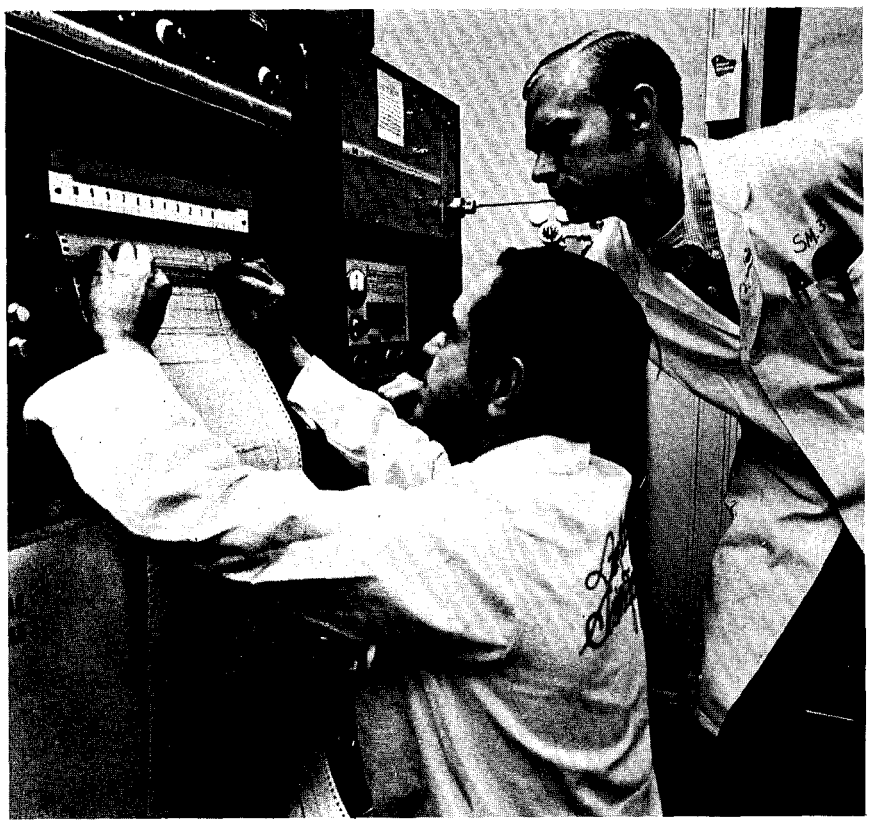
One advancement that is expected to be a boon to Plowshare is a new addition to the ranks of conventional explosives which are used to trigger nuclear devices. Called PYX—a welcome substitute for 2, 6-bis (picrylamino)-3, 5-dinitropyridine—it was synthesized by Mike Coburn of GMX-2.

PYX is a heat resistant explosive. This means it will retain its explosive power even when subjected to high temperatures. There are several explosives of this type available and each one has an upper limit of heat resistance. Beyond these upper limits they begin to decompose and lose their potency.

Why heat resistant explosives are necessary in Plowshare experiments was explained by Harlow Russ, W-3's alternate group leader. Russ exemplified his explanation with the Plowshare Program's Project Rulison which was conducted in September of 1969.

Rulison was the Laboratory's first major entry in the Plowshare Program. It was an experiment to help determine the technical and economic feasibility of using nuclear explosives to stimulate production of natural gas in rock formations of low permeability. Group W-3 provided the nuclear explosive for this experiment.

According to Russ, "The Rulison device was planted 8,430 feet below



Mike Coburn, GMX-2, who synthesized the heat resistant explosive PYX, studies a recording of a compound's carbon, hydrogen and nitrogen values with Manuel Naranjo, kneeling, aslo of GMX-2.

the ground's surface. At the bottom of the hole, it was 218 degrees Fahrenheit—water boils at 212 degrees—and our device had to stay down there a long time—during insertion, backfilling, and until weather conditions were right for detonation. This time period was 28 days.

"The deeper you go the hotter it gets. The earth is the source of heat. There is a geothermal gradient that is a guide for what temperatures can be expected at various depths. But sandstone formations such as at Rulison seem to conduct heat better than other formations so the geothermal gradient doesn't necessarily apply.

"For the Rulison Project, we asked the Naval Ordnance Station in Indianhead, Md. for an explosive that would withstand temperatures up to 230 degrees. Marguerite Chang at Indianhead developed the explosive for us and we tested it here at this temperature for periods ranging from 30 to 60 days before using it at Rulison."

Other gas stimulation Plowshare projects that have been proposed require the detonation of nuclear devices at even greater depths than Rulison. In preparation for these projects, Chang developed another heat resistant explosive for W-3 that would withstand temperatures from 250 to 300 degrees. "This second lot," Russ said, "is now being tested at 260 degrees for a period of 100 days and we are also conditioning it for 280 degree tests."

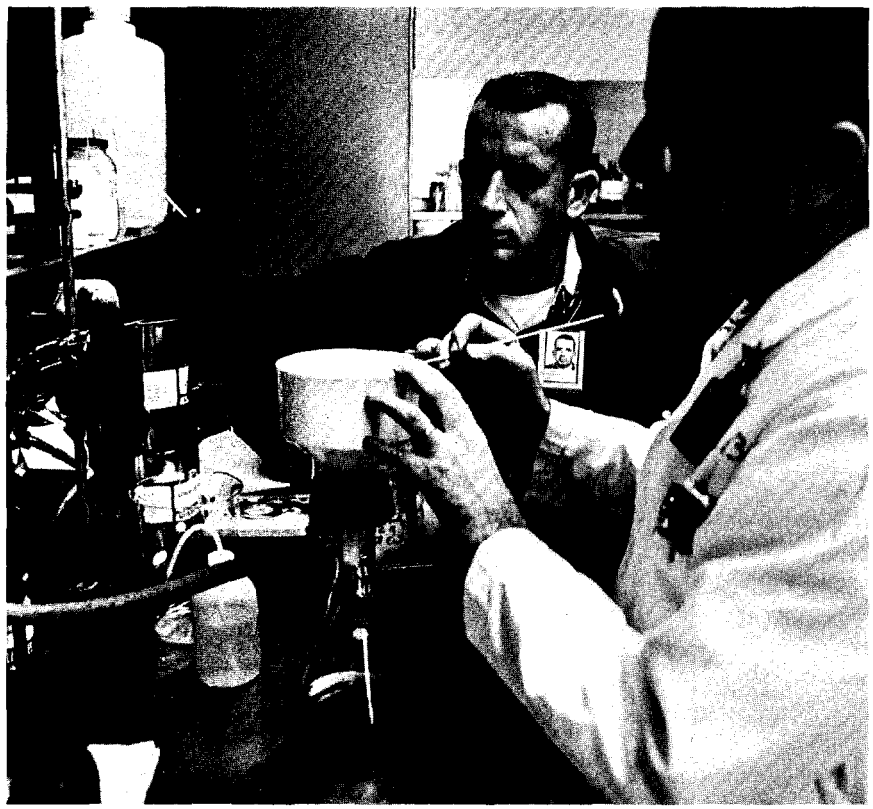
Through tests conducted to date, W-3 personnel have confirmed the explosive's ability to withstand temperatures of 250 degrees for 45 days without decomposing. "This," Russ said, "is our present capability without having to refrigerate the device."

Testing of Chang's newly-developed explosive was underway when GMX-2 was asked to develop an explosive with improved resistance to high temperatures. As a result,

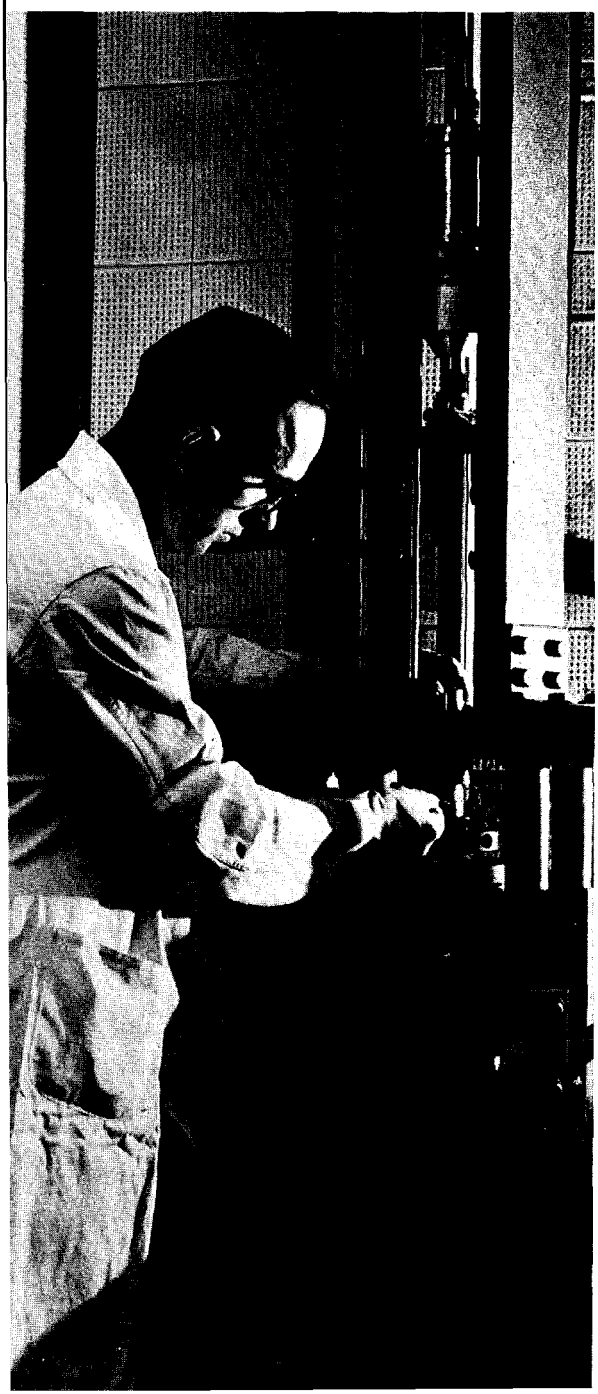
continued on next page

Right, John Chenault, W-3, and Harlow Russ, W-3 alternate group leader, calibrate instruments for a "closed bomb" test. The bomb is a closed cylinder which will contain a small explosion. Instrumentation wired to it provides information on pressure, temperature and quickness of detonation. This is one method by which PYX will eventually be evaluated by W-3. Below, John Salazar and Donald Winchell, both of W-3, prepare the closed bomb for a test at a firing point.

Right, Ted Benziger and Richard Davey work with small quantity of PYX in one of the GMX-2 laboratories. Benziger is working on a process by which PYX can be made more economically than other heat resistant explosives.



Frank Muse, GMX-2, places a small amount of an explosive between the striker and anvil of the impact machine. The distance in centimeters the two-and-a-half-kilogram weight (above Muse's hands) must fall to ignite the explosive is a measure of its sensitivity.



Coburn, an organic chemist who has synthesized hundreds of explosive compounds in his work at the Laboratory, prepared PYX.

Tests have shown that PYX is as heat resistant as its closest counterpart, more powerful and, through a production process being developed by Ted Benziger, also of GMX-2, less costly.

Coburn explained that in tests with small quantities of the explosive, PYX will withstand temperatures of 500 degrees for months without melting or decomposing. At 575 degrees the explosive decomposes at a measurable rate but will retain its potency for several hours. Only one other explosive, the chemist said, is as heat resistant as PYX. It was developed by the Navy.

Calculations made by Charles Mader of T-5 indicate PYX is 20 per cent more powerful than its Navy counterpart, whose power is about the same as that of TNT, and that its sensitivity is such that it can be handled with normal procedures.

Sensitivity of an explosive, Coburn said, is measured at LASL in centimeters—the distance a two-and-a-half-kilogram weight must fall in order to ignite it. The sensitivity of PYX is 63 centimeters (about 25 inches). By comparison, the sensitivity of TNT is 160 centimeters (about 63 inches).

Studies being conducted by Benziger indicate PYX can be produced more economically than other heat resistant explosives. Plans call for producing the new explosive on a pilot plant scale. In addition Benziger is formulating PYX compositions for evaluation by W-3. Surprisingly, he said, one of the process difficulties is finding commercial plastics for use as a binder that will withstand the high temperatures for which PYX is designed.

The two scientists feel that the capability of PYX to withstand high temperatures and develop more power at lower costs makes it attractive to the Plowshare Program as well as weapons and space applications.

Richard Taschek Named Assistant Director; Motz, Cowan, Thorn are Division Heads

Richard Taschek

Henry Motz

George Cowan

Robert Thorn

A new assistant director has been named, a new division formed and another division divided at the Los Alamos Scientific Laboratory.

Richard Taschek, P-division leader since 1962, has been appointed to the newly-created post of Assistant Director for Research. Harold Agnew, LASL director, said Taschek will have the basic responsibility for working with relevant division leaders attempting to plan the Laboratory's overall research program which is not specifically related to programmatic requirements. Taschek will place particular emphasis on LASL's future research programs and in determining the level of support to be provided for them.

Succeeding Taschek as P-division leader is Henry Motz, formerly associate division leader. Roger Perkins, formerly assigned to the P-division office, is alternate division leader.

A new technical division, CNC (Chemistry and Nuclear Chemistry), is headed by George Cowan, formerly J-11 group leader. Succeeding Cowan as group leader is James Sattizahn, formerly alternate group leader.

Cowan's division, Agnew said, will be concerned mainly with the Laboratory's efforts in the field of chemistry and nuclear chemistry. It is composed of personnel from J-11, CMF-2 and CMF-4 which have been designated CNC-11, CNC-2 and CNC-4 under the new group structure.

The remaining CMF-division groups—CMF-5 and CMF-13—have joined CMB-division. Richard Baker, CMB-division leader, noted the designations for these two groups are CMB-5 and CMB-13 respectively.

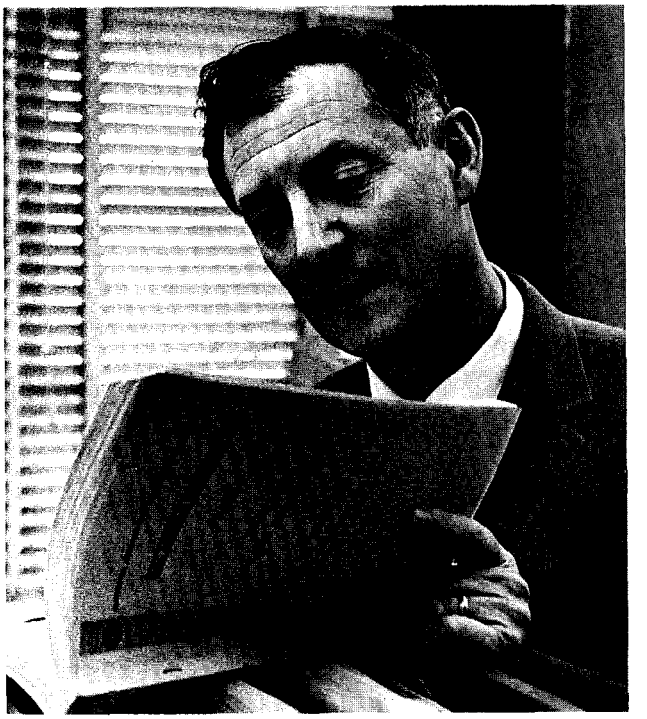
The Laboratory's T-division has been divided into TD (Theoretical Design) and T (Theoretical) divisions.

Robert Thorn, formerly alternate T-division leader and T-2 group leader, is TD-division leader. Harry Hoyt, formerly associate W-division leader, is alternate division leader, and Robert Canada, formerly W-4 group leader, is associate division leader.

Thorn's division consists of about 120 persons and is composed of the former groups T-2, T-4, T-5, T-8 and W-4. The group structure of the new division is: TD-1, Ralph Cooper, group leader, and John F. Barnes, alternate; TD-2, Raymond Pollock, group leader; TD-3, George Spillman, group leader; TD-4, Charles Cremer, group leader, and Robert Osborne, alternate; TD-5, George White, Jr., group leader, and Thomas Godfrey, alternate; TD-6, Edmond Cashwell, group leader.

Carson Mark is acting T-division leader and George Bell is associate division leader until further notice. The division consists of the remaining T-division groups—T-1, T-3, T-9 and T-10—and has about 70 employees. Eventually, Agnew said, it may include other Laboratory groups or individuals who have clearly defined responsibilities in providing general theoretical support for weapons and other Laboratory programs.

Among Apollo 13 Investigators Fred Edeskuty was an 'Outsider'



Fred Edeskuty, P-8 associate group leader, reviews a report on the Apollo 13 investigation.

No sooner had the Apollo 13 command module with its three astronauts splashed down in the Pacific Ocean than the National Aeronautics and Space Administration (NASA) launched a massive investigation to find out what went wrong. The lunar mission was aborted and the lives of the Apollo crew endangered for many hours after an explosion in the spacecraft's service module stripped the command module of oxygen and power. What had happened and what could be done to assure that it wouldn't happen again?

To find out, hundreds of NASA's technically qualified personnel, and other scientists from laboratories, universities and industry, were gathered at the Manned Spacecraft Center near Houston to carry out the investigation. Among the "outsiders" asked to participate was Fred Edeskuty of the Los Alamos Scientific Laboratory.

Not quite 24 hours after the astronauts splashed down, Edeskuty, P-8 associate group leader (then of CMF-9), and widely-recognized cryogenics expert, was called out of a classified meeting at the Laboratory to answer a long distance phone call. At the other end of the line was NASA's Andrew Potter who asked Edeskuty to participate. Potter was calling on behalf of Donald Arabian, leader

of the investigative organization which was designated Panel I.

Within the next two hours, Edeskuty secured the permission of Robert Fowler, then CMF-division leader, to take part in the investigation and made flight arrangements to leave for Houston the next morning.

The LASL cryogenist was one of eight consultants named to serve on Panel I. Others were C. P. Smith of Union Carbide Corporation; Charles Tiffany of the Boeing Company; Dudley Chelton and Richard Kropschot of the Cryogenics Division of the Institute for Basic Standards of the National Bureau of Standards; George Pinter of Grumman Aerospace Corporation; Robert Schwinghamer of the Materials Division at the Marshall Space Flight Center; and Guenther von Elbe of Atlantic Research Corporation.

"In addition to being available for any questions the investigators might want to ask us, we were told to nose around and contribute anything we could to the investigation and this is what we did," Edeskuty said.

The investigation hinged on data provided by several sources. Most important to the investigation was the detailed information on the spacecraft's system parameters recorded by the sophisticated telemetry equipment at the Manned Spacecraft Center in Houston. Then there were the first-hand experiences of the astronauts, data they had recorded, and photographs they had taken of the service module after it was separated from the command module. There were also telescopic photographs taken from ground stations at the Mount Kobau Observatory in British Columbia, Canada, the Manned Spacecraft Center, and the Corralitos Observatory, Las Cruces, New Mexico.

With the help of manufacturers, the investigators also utilized available documentation on the ground history of cryogenic oxygen tank 2, and the knowledge and experience of associated personnel, to conduct a review of the construction, certification, acceptance testing, servicing and other information pertinent to it. Tank 2, according to the data recorded during flight, was where Apollo 13's problems began.

The spacecraft was about 47 hours into the flight when the fans in tank 2, used periodically to stir the cryogenic oxygen to maintain uniform temperature throughout, were activated. Six seconds after this fan cycle began the tank's quantity measurement gauge failed. The gauge, an aluminum capacitor which measures the density of the cryogenic oxygen, went full scale, indicating the tank was full, even though it had been in use.

Nine hours later, nearly 200,000 nautical miles from earth, the astronauts had completed a television transmission back to earth and had just changed the orientation of the spacecraft to photograph a stellar phenomenon—the Bennett 1969-II comet—when Commander James Lovell remarked: "Houston? We've got a problem."

The astronauts reported hearing a loud "bang" and seeing a warning light go on. Then, in rapid succession, they reported problems with two of the service module's three fuel cells which supply power for the spacecraft and produce water as a by-product.

They also reported some sort of gas venting from the service module and difficulty in stabilizing the space vehicle.

On the ground, NASA personnel manning the huge and complex telemetry equipment at the Manned Spacecraft Center in Houston were also receiving information denoting trouble aboard Apollo 13. Telemetry data showed a series of electrical shorts had occurred when the fans in tank 2 were activated. The first short came two seconds after the fans were turned on and was indicated in the current from fuel cell 3. In the next several seconds two more shorts occurred.

Within 12 to 15 seconds after the fans were turned on, tank 2 pressure, which was about 880 pounds per square inch, began to increase. After 90 seconds the pressure reached 1,008 psi. Then the pressure decreased to 996 psi in nine seconds. The flow rates of the fuel cells responded to the pressure changes.

During the last 25 seconds of the pressure rise, the temperature in the tank rose rapidly. The quantity guage which had failed nine hours earlier corrected itself and then failed again.

Equipment monitoring spacecraft rates and acceleration indicated a vibration in Apollo 13, and then, Houston lost contact with the spacecraft for about two seconds.

When data started coming in again, it showed that the spacecraft's orientation had changed slightly; tank 2 pressure was reading zero; tank 1 pressure was decaying rapidly; and temperature sensors in bays 3 and 4 of the service module were reading up to eight degrees Fahrenheit higher than before the data loss.

Two and a half minutes later, fuel cells 1 and 3 stopped generating electrical power, and two hours later, fuel cell 2 was turned off as a result of the pressure loss in cryogenic oxygen tank 1.

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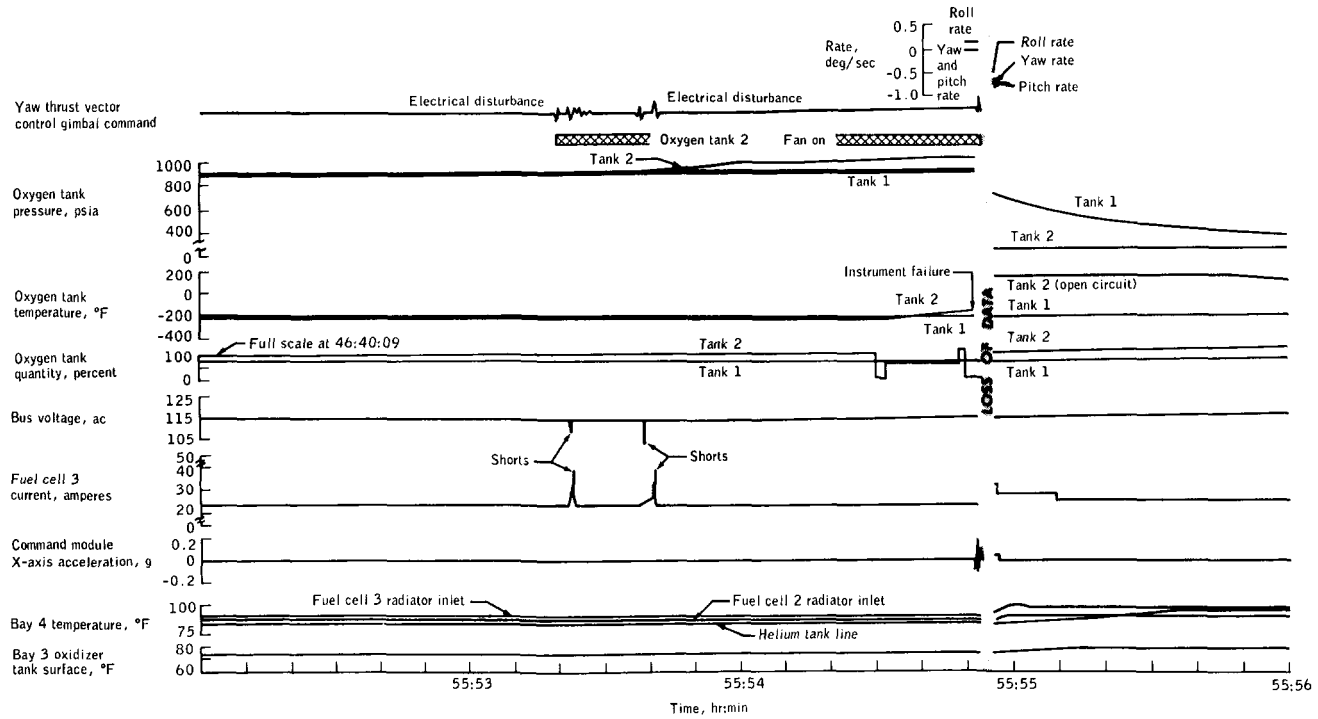
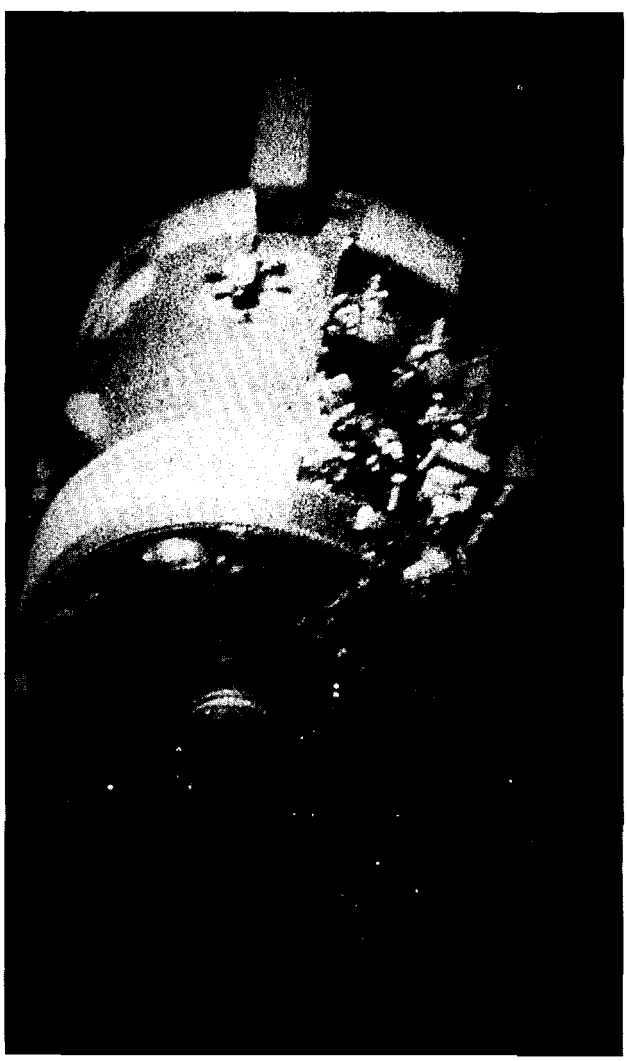


Above is a compilation of significant events associated with the abortion of the Apollo 13 space mission. Below is the damaged service module photographed by the astronauts. (NASA Photos).



Prior to re-entering earth's atmosphere the astronauts jettisoned the service module according to schedule. While looking at and photographing the service module as it separated from the lunar and command modules, the astronauts reported the panel covering bay 4 had been blown away and that debris was dangling out the opening near the antenna system which they relied upon for space to ground communication. Bay 4 housed the three fuel cells, both oxygen tanks and two hydrogen tanks.

Panel I was convened to determine the mechanics of the failures recorded, and observed and photographed by the astronauts. In a sense the investigation called for recreating the incident on the ground.

According to Edeskuty there were two phases to the investigation. First, there was the cause of the failure of tank 2 in flight, and secondly, the possible contributing factors during the ground history of the tank that could have led to the ultimate failure in flight.

The review of the ground history of tank 2 revealed two occurrences that were unique when compared to other tanks used in previous Apollo missions. The first occurrence was when the shelf on which the oxygen tanks were mounted was being removed from bay 4 so that modifications could be made on vacuum-ion pumps connected by a bracket to the outer housing of the oxygen tanks. A bolt connecting the shelf to its mount in

the service module was not removed, causing the handling fixture to fail and the shelf to drop approximately two inches back onto its mounts. Through tests, it was determined that the shelf components were built to withstand greater shock loads than could have occurred when the shelf was dropped. For this reason the incident was not considered to be serious enough to impair the operation of the tank.

The second occurrence was at Cape Kennedy during the pre-launch countdown demonstration test. The normal oxygen loading sequence had been completed and Cape personnel were preparing to reduce the quantity in the tanks. At this point, the normal detanking procedure—putting gaseous oxygen through the tank's vent line to force the cryogenic oxygen out its fill line—did not work. Several additional attempts also failed. Finally the procedure was supplemented by turning on the tank's heater and fans to "boil off" the liquid oxygen and detanking was accomplished.

After analyses of this procedure, Panel I investigators attributed the detanking problem to loose or misaligned plumbing components in the dog-leg portion of the tank fill line. Manufacturing tolerances were such that either of these conditions could have been caused by contraction of the components when exposed to cryogenic temperatures. Loose or misaligned plumbing in the fill line, however, does not affect the tank's operation during flight and it was judged not to have caused the incident.

What the investigators feel eventually led to failure of tank 2 in flight was the use of the tank heaters in off-loading the cryogenic oxygen after normal detanking procedures failed. The heater-on time was about eight hours. At that time, it was thought the temperature inside the tank would not get high enough in the presence of cryogenic oxygen to require the tank's thermal switches to operate. But, if it did, then the thermal switches would function to avoid any overheating.

Tests conducted by Panel I investigators, however, showed the voltage output of the ground power supply used to energize the heaters was greater than the thermal switches were designed or tested for, and when the switches attempted to open, their contacts fused. Other tests showed that when the heaters are on for the duration experienced during the countdown demonstration test, the teflon insulation on the fan motor wires becomes severely degraded. It splits and cracks.

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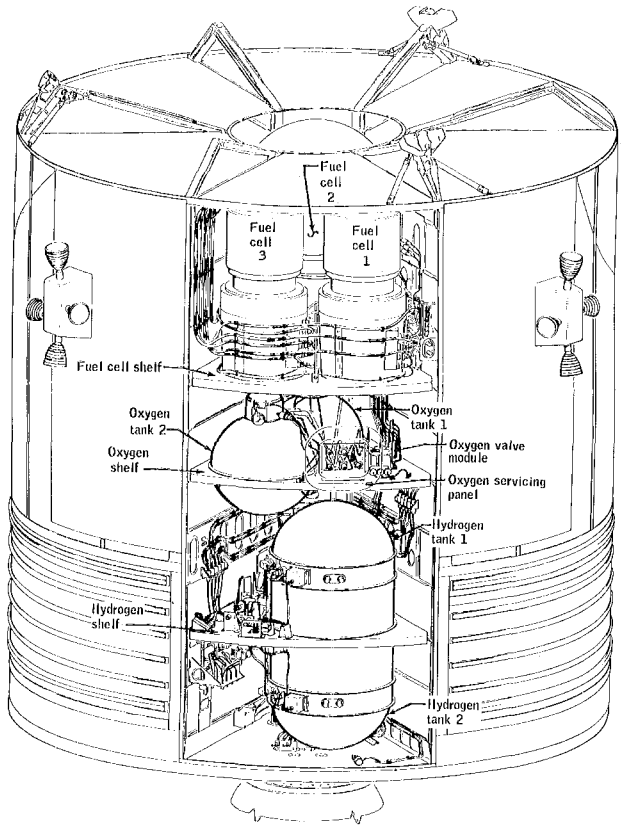
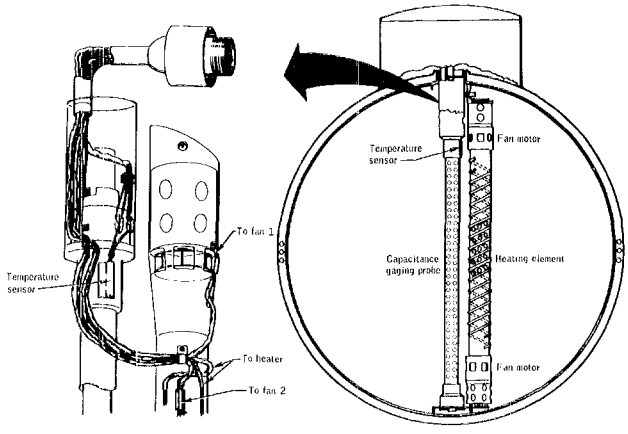
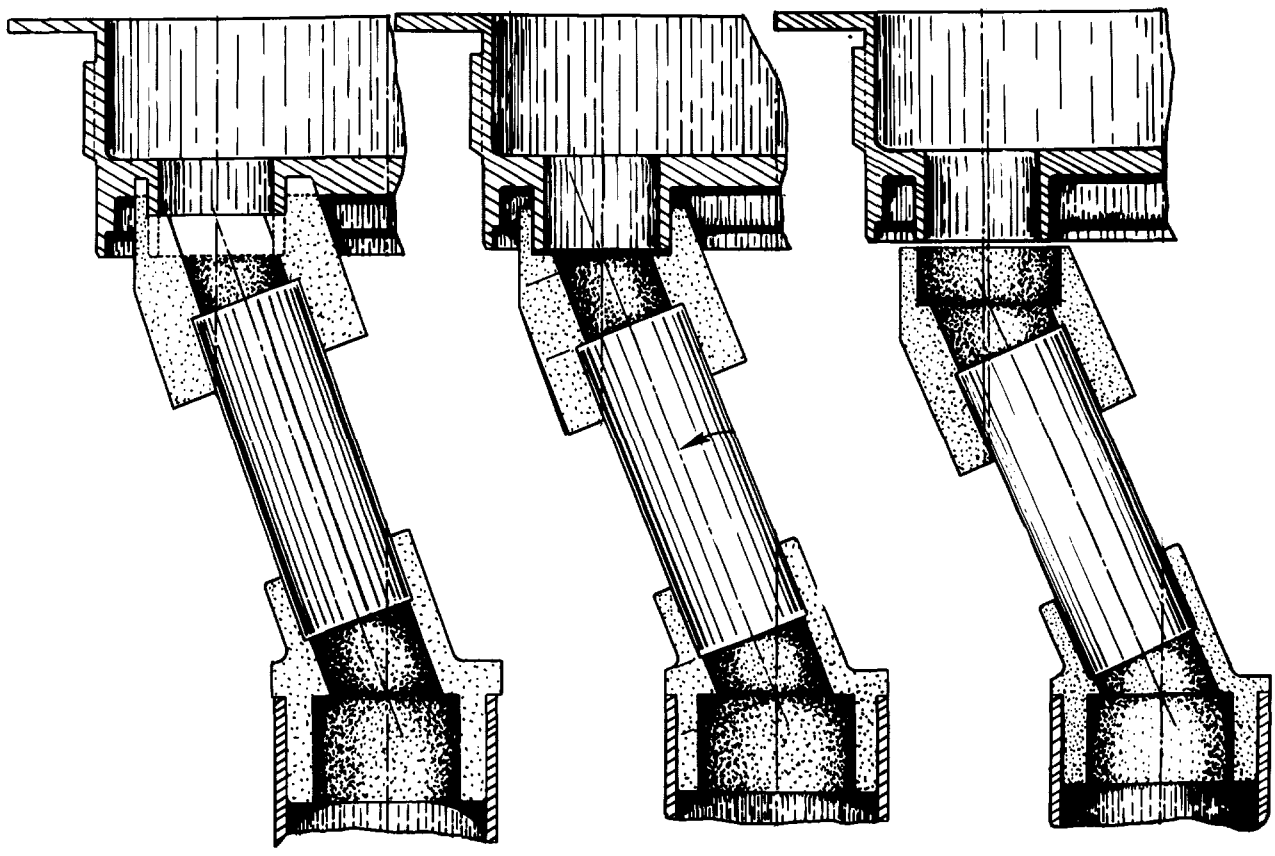


The arrangement of fuel cells and cryogenic systems in the service module is depicted in this illustration provided by NASA.

The arrangement of components and wiring within the oxygen tanks is shown in this NASA illustration.





Worst case, long | Nominal dimensions | Worst case, short

Investigators attributed the detanking problem to loose or misaligned plumbing components in the dog-leg portion of the fill line. This NASA illustration depicts the extreme cases that could occur because of allowable manufacturing tolerances.

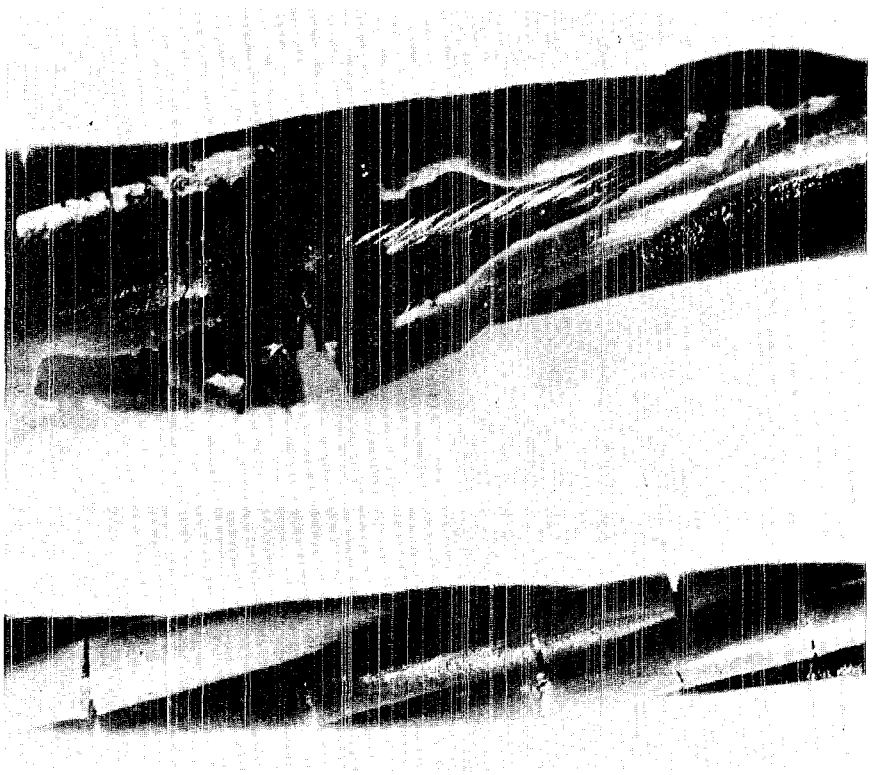
In determining the cause of tank 2's failure in flight, Panel I investigators examined a total of 46 mechanisms in detail to see if any of them would fail in a manner that would correlate with the data taken during the incident in flight. Each mechanism was assessed as a "possible" or "unlikely" candidate in order to narrow the field to a reasonable number. When this had been done, the "possible" candidates were studied and tested extensively under simulated conditions.

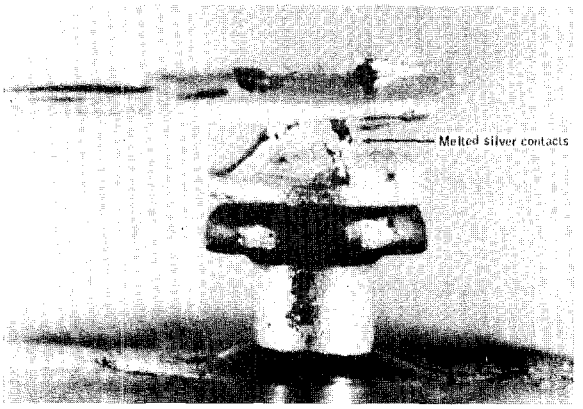
According to the conclusions reached by Panel I the failure of the tank 2 quantity measuring guage nine hours before tank failure could not have ignited the wiring insulation because its electrical energy was not great enough.

What most likely happened was that the degraded fan wiring caused electrical shorts within the tank. The energy output from the shorts that occurred when the fans in tank 2 were turned on, was greater than necessary to ignite the teflon insulation on the wires carrying power to the fan motors. The fire within the tank caused pressure to increase to 1,008 psi at which time a relief valve opened, just as it was supposed to, and decreased the pressure in the tank to 996 psi. By this time all of the energized electrical circuits to tank 2 had shorted and opened. The burning continued into the conduit through which electrical wiring enters the tank. The intense heat melted the conduit and the fire and gases spread into its vacuum jacket. Pressure built up in the jacket and burst its rupture disc, allowing the fire to spread into bay 4 where layers of Mylar and Kapton insulation were ignited. The pressure in the bay immediately increased and blew the panel covering bay 4 off the service module. The separation of the panel from the module damaged one of the four high-gain antenna dishes, interrupting the communications signal to earth.

The shock of the panel separating caused the oxygen supply valves to close on lines leading to fuel cells 1 and 3. These closures were undetected

Below, teflon insulation on fan motor wires split and cracked during tests in which heaters were turned on for the duration experienced in the countdown demonstration test. (NASA photo)





The power supply used to energize the heaters was greater than the thermal switches were designed or tested for, and when the switches attempted to open, their contacts fused. (NASA photo)

by the astronauts because a warning was given only when both oxygen and hydrogen valves to a fuel cell were closed. Starved for oxygen, the two fuel cells quit generating electrical power.

Tank 1 developed a leak either as a result of shock when the panel separated or because of the forces associated with the failure of the tank 2 electrical conduit. Pressure in tank 1 eventually went to zero and fuel cell 2 was shut down for lack of oxygen.

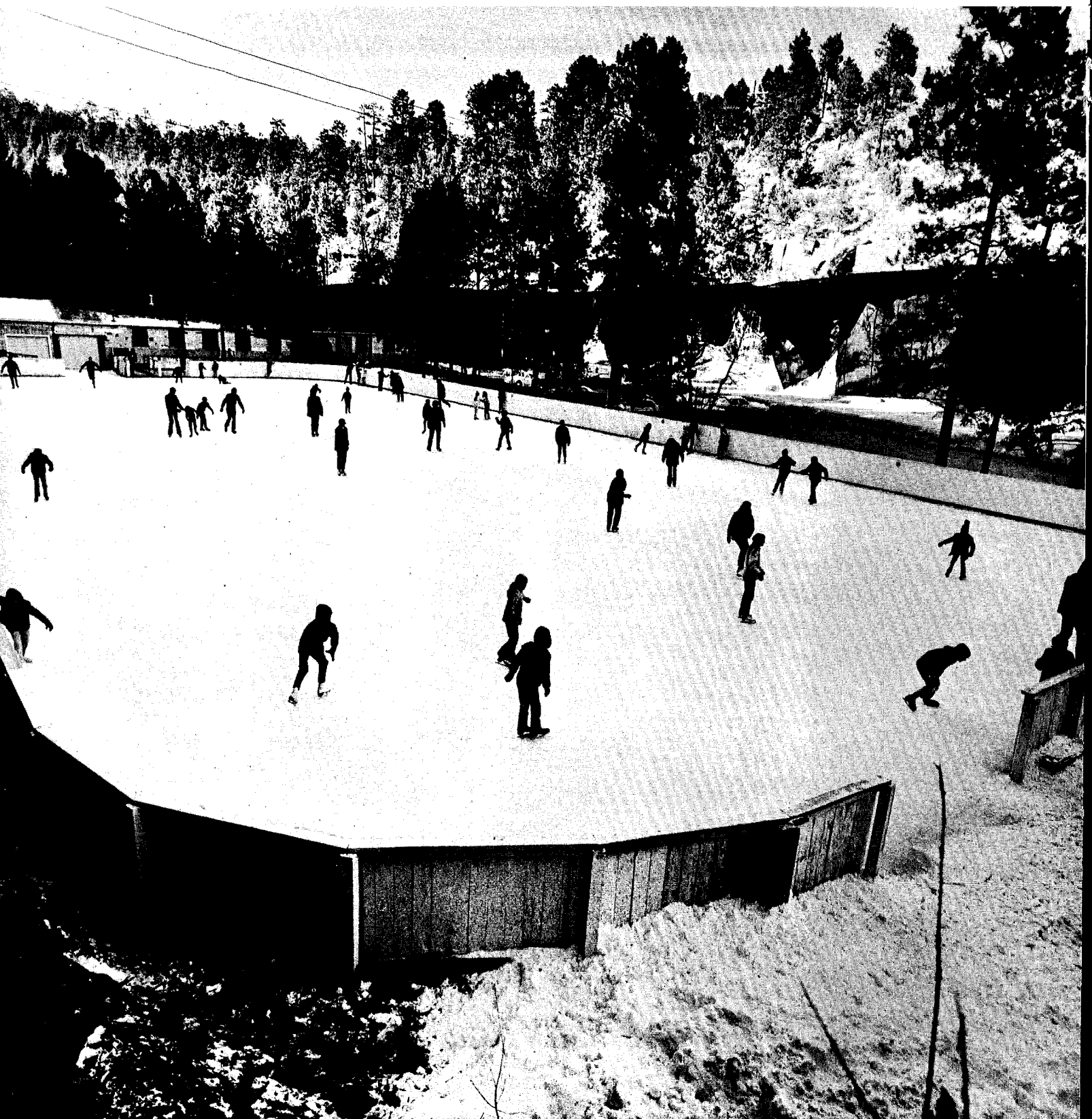
As a result of the investigation, corrective action will be taken to prevent a recurrence of the Apollo 13 incident during subsequent Apollo flights. The oxygen tank design will be changed to minimize materials which could be ignited by other mechanisms in the tank and lead to a fire within it, causing a structural failure. All the electrical wires will be sheathed with stainless steel, the fans will be removed, a temperature sensor will be installed on the heater assembly, and the quantity gauge will be manufactured from stainless steel instead of aluminum. The fill line plumbing inside the tank will be made in one piece and a means will be provided to warn the crew of an inadvertent closure of either the fuel cell hydrogen or oxygen valves. Also, the fuel cell oxygen supply system will be redesigned to isolate the teflon wires from the oxygen.

A third cryogenic oxygen tank will be added to the service module, and the warning systems in the Mission Operation Control Room at the Manned Spacecraft Center will be modified to provide more immediate visible and audible warnings of system irregularities.

Said Edeskuty, who spent two weeks at the Manned Spacecraft Center in connection with the investigation conducted by Panel I, "I was highly impressed by both the quality and quantity of the investigation."

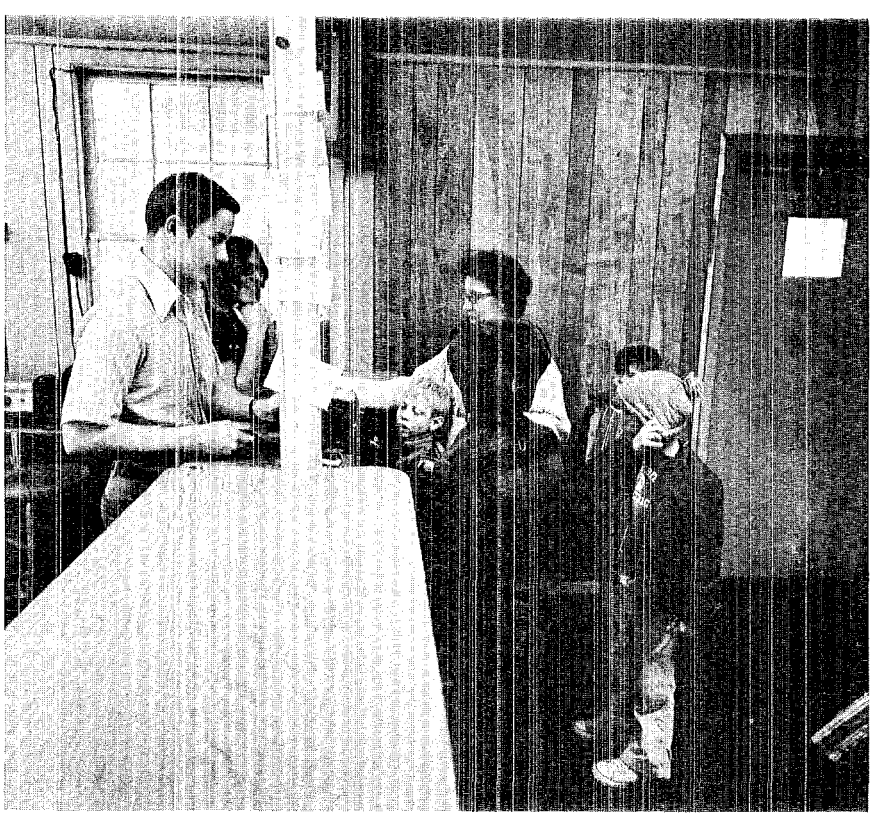
Trek of the Skaters

Ice skating was one of the ways many Los Alamos youngsters spent their time when school recessed for the holidays.

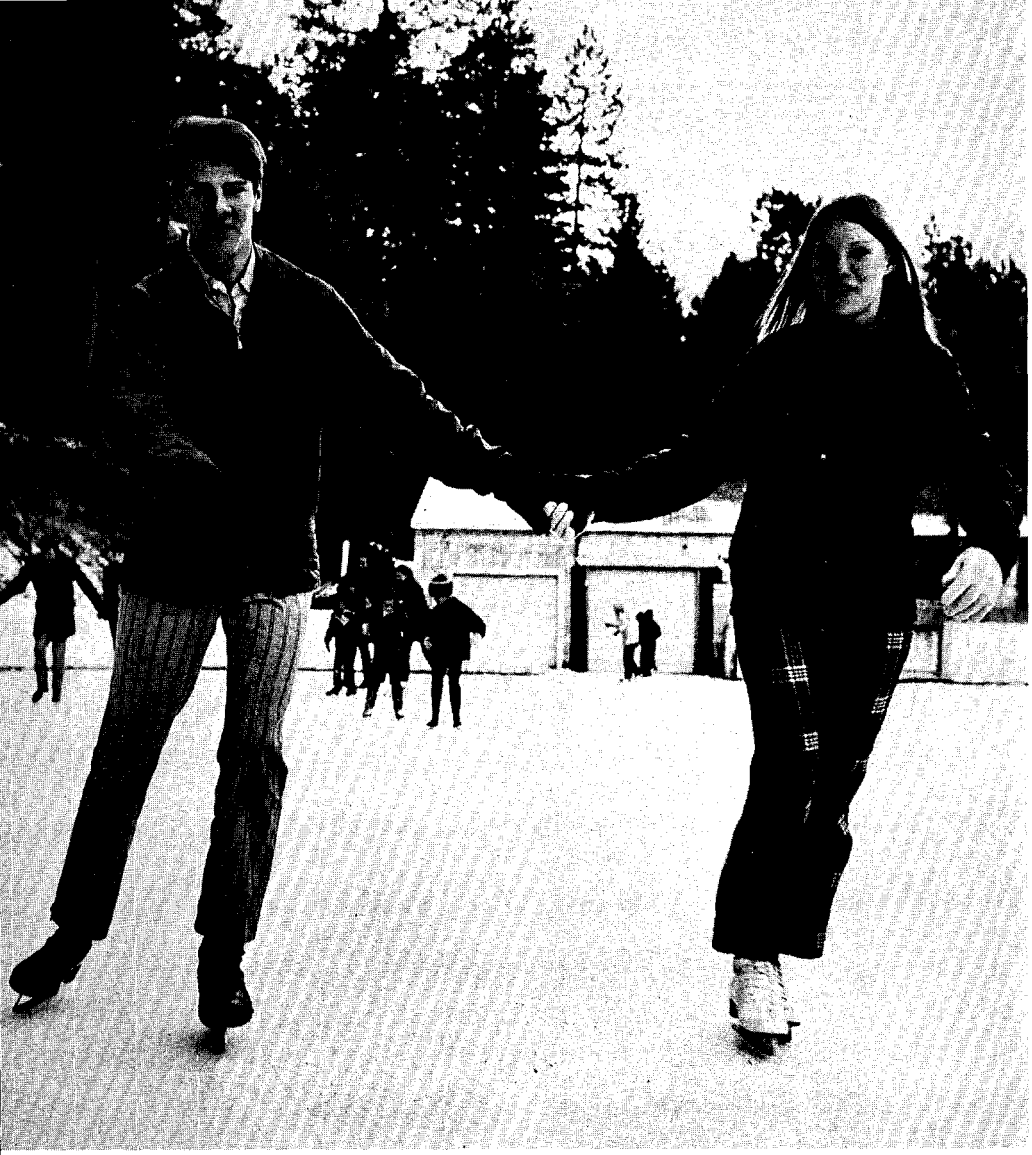


Above, six-year-old Pat Conn sits on the floor of the warming house with a cup of hot chocolate before rejoining his friends on the ice.

Among improvements made by the Skating Association for this winter season was the modernization of the warming house, above.



Randy Holmberg and Tina Nereson, left, rent Mrs. Harry Hecht some skates.



Above, four-year-old David Gurley is a newcomer on ice, but he gets a little help from his mother, Mrs. Lawrence Gurley.

Andrew Florin and Julie O'Hare skate together during a short couples session.

Another newcomer kicks his leg high as he goes off balance. He too has some experienced help.

short subjects

Science Youth Days at the Los Alamos Scientific Laboratory are scheduled April 14-16.

The event was not held last year. But, in 1969, 650 students from 38 schools in the southwestern states toured LASL facilities.

Tom Langhorst and **Carl Cuntz,** both of ISD-2, are co-chairmen for the event. **Bob Brashear,** ISD-2 assistant group leader, will handle public information duties for the observance.

Los Alamos High School students will tour LASL facilities during the first day. Local senior science students will serve as honor guides for out-of-town students the next two days.

A 12-member panel, chaired by LASL'S **Wright Langham,** has completed a report which contains tentative radiation protection guides to be used in mission-planning and vehicle-design studies for manned space operations during the next 10 to 20 years.

The report was compiled at the request of the National Aeronautics and Space Administration by the Radiobiological Advisory Panel of the Space Science Board's Committee on Space Medicine. Its title is "Radiation Protection Guides and Constraints for Space-Mission and Vehicle Design Studies Involving Nuclear Systems."

Langham, who is assistant H-division leader for biomedical research and H-4 group leader, has been chairman of the Radiobiological Advisory Panel for eight years. He noted that the recently completed 80-page report is a follow-up to a 325-page contribution by the panel which deals with radiation problems with respect to the current Apollo missions.

Thomas Turner, a former Laboratory employee, died in December. A section leader in MP-2, Turner retired in September. He is survived by his wife, Joy, and son Hugh.

The AEC's General Advisory Committee will meet in Los Alamos February 23-25. **Jane Hall,** former LASL assistant director, is a committee member.

Two employees of the Laboratory have retired.

John Atwood, SD-5 machinist, retired after 19 years with the Shop department. Atwood and his wife, Bernice, will continue to make their home in Los Alamos.

Tressa Minshall, P-1 electronics assembler, retired after 18 years, all of which were in P-division. Mrs. Minshall plans to remain in Los Alamos.

George Bell, associate T-division leader, has been appointed visiting professor of biophysics in the University of Colorado School of Medicine.

Marie Murphy, GMX-7 detonator operator, died Dec. 22 at the Los Alamos Medical Center. She had been employed by the Laboratory since 1959. She is survived by her husband, Marvin, who is employed by CMB-6, and three children: Danny, Patricia and Michael. Services were held in the United Church of Los Alamos.

More than 70,000 persons visited the Norris E. Bradbury Science Museum during 1970. Included in this number were many students from all areas of the United States and visitors from 87 foreign countries. "The number of foreign countries represented is a record," said Robert Porton, ISD-2 group leader.

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the technical side

Presentation at Bettis Atomic Power Laboratory, Pittsburgh, Pa., Oct. 2:

"Multigroup Monte Carlo Development" by D. R. Harris, T-DOT (invited)

Presentation at Carnegie-Mellon University, Pittsburgh, Pa., Oct. 2:

"Anisotropy of Neutron Migration in Reactor Lattices of Fuel Rods and Coolant" by D. R. Harris, T-DOT (invited)

Presentation at the Monte Carlo Seminar-Workshop, Oak Ridge National Laboratory, Tenn., Oct. 5-7:

"The Andy Monte Carlo Transport Programs" by D. R. Harris, T-DOT

Presentation at the Texas-New Mexico Joint Session, American Society of Civil Engineers, El Paso, Texas, Oct. 8-10:

"Deformation Characteristics of the Volcanic Tuff in Los Alamos, New Mexico" by M. D. Keller, ENG-1

Presentation at meeting, Space Nuclear Propulsion Office, Washington, D.C., Oct. 28-29:

"The Morphology of Composite Fuel Elements, and the Changes Effected by Heat Treatment" by M. C. Smith, CMF-13

Presentation at the Department of Mechanical Engineering, University of Wyoming, Laramie, Nov. 2:

"Design of a High-Speed Drum for Calibration of Moxon-Rae Gamma Detectors" by A. N. Ellis, P-3

Presentation at the Fall Meeting, Nuclear Division, American Ceramic Society, Gatlinburg, Tenn., Nov. 3-6:

"Void Formation and Self-Irradiation Damage in $^{238}Pu_2$-ThO_2 Solid Solutions at Elevated Temperatures" by L. B. Lundberg, Dana L. Douglass and R. L. Keil, all CMF-5

"Radiation-Induced Changes in Polycrystalline, High-Purity Alumina and Yttria" by C. V. Weaver, W. H. Reichelt, E. W. Salmi, T. G. Frank and A. J. Patrick, all N-5

Presentation at the Annual Plutonium Isotopic Exchange Meeting, Richland, Wash., Nov. 4:

"UK 131 Plutonium Isotopic Exchange Sample" by R. K. Zeigler, C-5

Presentation at Colloquium, Sandia Laboratory, Albuquerque, Nov. 4:

"Progress Report on LAMPF" by L. Rosen, MP-DO

Presentation at the Institute of Electrical and Electronic Engineers' 1970 Nuclear Science Symposium, New York City, Nov. 4-6:

"A Method of Calibration of Moxon-Rae Detectors" by A. N. Ellis, P-3, W. K. Brown, formerly P-3, J. A. Farrell and R. R. Fullwood, both W-8

"Delay Time Studies in Channel Electron Multiplier" by W. L. Briscoe, P-1

Presentation at the 12th Annual American Physical Society Meeting, Washington, D.C., Nov. 4-7:

"An All-Metal Discharge Tube for High E Z-Pinch Experiments" by J. A. Phillips, P-14

"The Z Pinch: Past and Future" by J. A. Phillips, P-14 (invited)

"Stability of Collisionless Electrostatic Shocks" by C. K. Chu, Columbia University, New York City, and H. Weitzner, New York University (work done in P-18)

"Magnetohydrodynamic Stability of Scyllac Configurations" by J. P. Freidberg and B. M. Marder, both P-18

"A Laser Induced Plasma Instability" by B. M. Marder, J. P. Freidberg, and C. W. Nielson, all P-18

"Superconductors as Fast Current Breakers" by H. L. Laquer, P-8, and D. B. Montgomery, formerly P-15

"Current Sheath Motion and Restrikes in the Plasma Focus Accelerator" by K. D. Ware, J. W. Mather, P. J. Bottoms, J. P. Carpenter and A. H. Williams, all P-7

"A Short Open Multi-Mode Microwave Resonator for Plasma Density Measurement" by J. McLeod and H. Dreicer, both P-13

"Electron Cyclotron Drift Instability" by R. L. Morse and C. W. Nielson, both P-18, and D. W. Forslund, T-12

"50-kV Switch and Capacitor Module Development for Plasma Focus Research" by J. P. Carpenter, A. H. Williams, J. W. Mather, P. J. Bottoms and K. D. Ware, all P-7

"A Swinging Marx Power Supply for Plasma Focus Experiments" by P. J. Bottoms, J. W. Mather, J. P. Carpenter, K. D. Ware and A. H. Williams, all P-7

"Anomalous Resistivity for Large Amplitude Electric Fields Near the Electron Plasma Frequency" by H. Dreicer, J. C. Ingraham and D. B. Henderson, all P-13

"Measurement of Ion Flux and Drift Speed Using Radioactive Ions" by D. B. Henderson and H. Dreicer, both P-13, and D. Mosher, formerly P-13

"A Numerical Study of the Helically Symmetric Theta Pinch" by T. A. Oliphant, P-18, F. L. Ribe, P-15, and H. Weitzner, New York University, New York City

"A Fast Z Pinch" by J. N. DiMarco and L. C. Burkhardt, both P-14

"Numerical MHD Calculations of Shock Heated Z Pinches" by A. Haberstich, P-14

"Feedback Stabilization on Scylla-IV" by K. I. Thomassen, Massachusetts Institute of Technology, Cambridge, and D. M. Weldon, P-15

"Helical Equilibrium and Stability Experiments in a Three-Meter Theta Pinch" by W. E. Quinn, F. L. Ribe and K. S. Thomas, all P-15

"Interferometric Measurements on a Helical Plasma Column" by R. E. Siemon, P-15, and H. Weitzner, New York University, New York City

"On the Formation and Structure of Strong Electrostatic Collisionless Shocks" by C. R. Shonk, J-10, and D. W. Forslund, T-12

"A Double-Cavity Laser Interferometer Operating at Three Hun-

dred and Thirty Seven Microns" by R. W. Peterson and F. C. Jahoda, both P-15

"MHD Studies of Toroidal Z-Pinch and Related Equilibria" by D. A. Baker, P-18, and L. W. Mann, T-5

Presentation at Fall Meeting, American Physical Society, Division of Particles and Fields, Austin, Texas, Nov. 4-7:

"Elementary Particles at LAMPF" by P. A. M. Gram, MP-6 (invited)

"Progress Report on the Los Alamos Meson Facility" by L. Rosen, MP-DO (invited)

"Theoretical Evidence for 1 ≤ O Z*'s" by R. Aaron, Northeastern University, Boston, Mass., R. D. Amado, University of Pennsylvania, Philadelphia and R. A. Silbar, T-9

Presentation at Chemistry Seminar, Florida State University, Tallahassee, Nov. 5-6:

"Status of Anomalous Water Research" by S. W. Rabideau and A. E. Florin, both CMF-2 (invited)

"Phase Transitions in High Pressure Forms of Ice" by S. W. Rabideau, CMF-2, and G. P. Arnold, R. G. Wenzel and N. G. Nereson, all P-2 (invited)

Presentation at a seminar, Physics Division, University of Chicago, Ill., Nov. 5:

"Conjectures on the Nature of Ball Lightning" by J. L. Tuck, P-DO

Presentation at CAMAC Session, Nuclear Science Symposium, New York City, Nov. 6:

"CAMAC Systems at LAMPF" by D. R. Machen and L. R. Biswell, both MP-1 (invited)

Presentation at Physics Department, Columbia University, New York City, Nov. 9:

"Plasma Focus" by J. W. Mather, P-7

Presentation at Physics and Chemistry Departments, Grambling College, La., Nov. 9:

"Present and Future Research Utilization of the Los Alamos Meson Physics Facility" by J. E. Brolley, P-DOR (invited)

Presentation at Conference on Continuum Aspects of Graphite Design, Gatlinburg, Tenn., Nov. 9-12:

"Description of Design Requirements for Graphite Components" by J. C. Rowley, N-7 (invited)

"A Simplified Approach to Predicting the Onset of Fracture in Brittle Materials" by R. W. Andrae, N-7

"The Fracture Mechanism in Polycrystalline Graphites" by M. C. Smith, CMF-13 (invited)

"Correlation of Properties of Manufactured Graphites" by P. E. Armstrong, CMF-13

Presentation at the Air Force Weapons Laboratory, Kirtland Air Force Base, Albuquerque, Nov. 10:

"A Review of the Los Alamos Dense Plasma Focus Program" by J. W. Mather, K. D. Ware and P. J. Bottoms, all P-7

Presentation at the Symposium on Science and Engineering of Underground Nuclear Device Experiments, Lawrence Radiation Laboratory, Livermore, Calif., Nov. 10-11:

"Weapon Output Calculations for Pinex" by K. C. Kohr, J-12

"Two-Dimensional Eulerian Calculations of Containment Problems" by C. F. Keller and S. T. Donaldson, both J-15

"Frequency Sampling Requirements in Reaction History Measurement" by D. R. Westervelt, J-14

"A 3,500 PSI Helium Scintillation Neutron Detector" by L. J. Brown, J-12

"Dynamic Television Pinex" by G. M. Smith, J-12

"Cuatro" by H. W. Kruse, J-14

"Fast-Neutron Diagnostics: TRIX" by H. W. Kruse, J-14

"Fast-Neutron Diagnostics: TRAX" by H. W. Kruse, J-14

"Mechanical Devices for Fast Closure of LOS Pipelines" by E. E. Shaw, J-7

"Nuclear Device Experiments and the Designer" by R. Canada, W-4

"Neutron Activation Pinex LOS Pipe and Detector Recovery" by R. N. Kennedy, J-7

"The Espejo Low Energy X-Ray Spectrometric Experiment on Diana Mist" by D. S. Metzger, J-14

"Accurate Soft X-Ray Detector Calibrations" by P. B. Lyons, J-14

"Recent LASL Stemming Load Experiments" by L. A. Ney, J-7

"Track Detectors for 14 MeV Neutrons" by W. M. Sanders, J-12

"Automated Numerical Filtering with Convergence Tests" by E. K. Hodson, J-14

"Predictable Unfolding in the Frequency Domain" by E. K. Hodson, J-14

"A Theoretical Study of Electromagnetic Pulses Generated in Neutron Pinex Measurements" by G. J. Berzins, J-12

"Development of a Soft X-Ray Calibration Facility" by J. A. Baran, J-14

"Processing Cable Measurement Data Using the G. E. Time Sharing System" by L. K. Zongker, J-14

"Photographic X-Ray Pinex Diagnostics Techniques" by S. N. Stone, J-10

"The Blenton Dynamic Pinex Test" by A. J. Lieber, J-12, and H. D. Sutphin, P-1

"The Use of Generation II Image Intensifiers in Gating" by A. J. Lieber, J-12

"Testing Serial Autocorrelation" by R. W. Humphrey, J-14

"A X^2 Goodness-of-Fit Test for Spectra" by D. R. Thayer, J-14

"Grape B . . . Experiments" by D. D. Eilers, J-15

"Pinhole Design Considerations and Calculational Techniques" by R. J. Hanold, J-15

"Physics of Water Wave Predictions for Underground Explosions" by K. H. Olsen, J-15

"Grape B . . . Experiments" by D. G. Gerke, J-14

"Containment Diagnostics" by C. E. Keller, J-15

"Neutron Activation Pinex" by D. D. Phillips, J-12

"Source Output Calculations" by C. G. Davis, J-15

"Cowles X-Ray Diagnostic Measurements" by M. M. Hoffman, J-12

"A Routine Time-Integrated TV Pinex" by M. R. Cates, J-12

Presentation at seminar, Physics Department, University of California, Los Angeles, Nov. 11:

"Recent Nuclear Spectroscopy Experiments at LASL" by O. Hansen, P-DOR (invited)

Presentation at Fall Meeting, Rio

continued on next page

Grande Chapter, Health Physics Society, Albuquerque, Nov. 13:

"Gloves for Tritium Work" by R. A. Jalbert, H-1

"Preliminary Measurements of 'Structure' Bremsstrahlung from Pulsed 5-MeV Accelerator" by J. R. Parker, MP-1, and M. J. Engelke, H-1

"Sampling for Plutonium-238 to Estimate Inhalation Hazard" by H. J. Ettinger and W. D. Moss, both H-5, and L. Johnson, H-1

"The Selection of Neutron Instruments for Health Physics Monitoring" by D. E. Hankins, H-1

"Correction Factors for 9 and 10 Inch Sphere Neutron Instruments and One Inch Diameter Bare BF_3 Tubes Used to Monitor Small Beams and Slits" by D. E. Hankins and G. W. Neely, both H-1

"Standardization of Thermoluminescent Dosimeters" by H. W. Craig and M. J. Engelke, both H-1

"Radiation Protection Experience With Handling Transuranium Elements at the Los Alamos Scientific Laboratory" by L. J. Johnson and D. D. Meyer, both H-1, and R. A. Penneman, CMF-4 (invited)

Presentation at joint meeting of the Colorado-New Mexico-Arizona Branches of the American Society for Microbiology, Tucson, Ariz., Nov. 13-14:

"Photobiology of the Bacterium **Haemophilus Influenzae**" by B. J. Barnhart and S. H. Cox, both H-4

Presentation at the American Nuclear Society 1970 Winter Meeting, Washington, D.C., Nov. 15-19:

"Collided Flux Diffusion Theory" by D. R. Harris, T-DOT

"Rover—An Intermediate Step to Gas" by C. B. Mills, T-DO

"Physics of Delayed Neutrons—Recent Experiment Results" by G. R. Keepin, A-1 (invited)

"Delayed Neutron Abundances and Half-Lives for 14.7 MeV Fission" by L. V. East, R. H. Augustson, H. O. Menlove, all A-1, and C. F. Masters, University of Missouri, Columbia

"Purification, Encapsulation, and Characterization of Plutonium-238 for Implantation Purposes" by L. J. Mullins and J. A. Leary, both of CMB-11 (invited)

"On The Accuracy of Space-Collapse for Fast Breeder Fuel-Cycle Analysis" by R. E. Alcouffe, T-1, and T. J. Hirons, W-4

"Large Accidents" by W. R. Stratton, L. B. Engle and D. M. Peterson, all N-2 (invited)

"Activities of the ANS-6 Subcommittee on Radiation Shielding Standards" by D. J. Dudziak, T-1, H. C. Claiborne, Oak Ridge National Laboratory, Tenn., and N. M. Schaeffer, Radiation Research Associates, Inc., Fort Worth, Texas (invited)

"Two-Stage Monte Carlo Calculations of Delayed Neutron Response" by L. L. Carter, T-8, and D. B. Smith, N-6

"High Reynolds Number, Low Temperature, Noble Gas Adsorption Bed Design" by C. A. Fenstermacher, J-18

"A Method for Estimating the Risk from a Plowshare Detonation" by H. J. Otway, J-DOT, and R. K. Lohrding, C-5

"A Risk Estimate for an Urban-Sited Research Reactor" by H. J. Otway, J-DOT, R. K. Lohrding, C-5, and M. E. Battat, T-1

"A Small Hot Cell Chemistry Plant' by J. W. Barnes, J-11

"Core Processing Facility" by P. F. Moore, J-11

Presentation at the International Metallographic Society Meeting, Cleveland, Ohio, Nov. 16-18:

"A Technique for Hot Cell Autoradiography" by D. D. Jeffries and L. A. Waldschmidt, both CMB-14

Presentation at Seminar for the Research and Development Department, Rocky Flats, Colo., Nov. 17:

"Nucleation, Acceleration and Diffusion in the Interaction of D_2" by R. M. Alire, C. L. Peterson, both W-7, and B. A. Mueller, CMF-5 (invited)

Presentation at Conference on Safety Aspects of Industrial Radiography, Louisiana State University, Baton Rouge, Nov. 17:

"Neutron Radiography Using Reactor Sources" by D. A. Garrett and R. A. Morris, both GMX-1

Presentation at the 21st Annual Meeting of the Histochemical Society, San Diego, Calif., Nov. 17-18:

"Model Particles for Automated Systems of Cell Analysis" by M. J. Fulwyler and L. S. Cram, both H-4

"Application of Fluorescent Feulgen Reaction to Cells in Suspension" by T. T. Trujillo and M. A. Van Dilla, both H-4

Presentation at the 12th Joint Army-Navy-NASA-Air Force Liquid Propulsion Meeting, Las Vegas, Nev., Nov. 17-19:

"Advanced Radioisotope Propulsion" by J. W. Neudecker, Jr., N-7, and P. Ericson, Air Force Rocket Propulsion Laboratory, Edwards Air Force Base, Calif.

Presentation at the First Annual Meeting, Solar Physics Division, American Astronomical Society, Huntsville, Ala., Nov. 17-19:

"Comments on X-Ray Burst—Ha Flare Relationships" by R. W. Milkey, W. H. Chambers, P. E. Fehlau and W. E. Kunz, all A-2, N. K. Blocker, formerly W-7, and J. C. Fuller, W-10

"Special Hardening During X-Ray Bursts" by W. E. Kunz, W. H. Chambers, P. E. Fehlau and R. W. Milkey, all A-2, N. K. Blocker, formerly W-7, and J. C. Fuller, W-10

"Solar Wind Speed Distributions: 1962-1970" by J. T. Gosling and R. T. Hansen, both High Altitude Observatory, National Center for Atmospheric Research, Boulder, Colo., and S. J. Bame, P-4

Presentation at the 16th Annual Conference on Magnetic Materials, Miami Beach, Fla., Nov. 17-20:

"Optical Absorption Spectrum of MnF_2 at High Fields" by R. S. Caird, W. B. Garn, C. M. Fowler and D. B. Thomson, all GMX-6

"Magnetic Properties of Cerium Bismuth, Neodynium Bismuth, Terbium Bismuth, and Dysprosium Bismuth" by G. P. Arnold and N. G. Nereson, both P-2

Presentation at seminar, University of California, Berkeley, Nov. 19:

"The Electron Component of the Solar Wind Plasma" by M. D. Montgomery, P-4 (invited)

Presentation at the 10th Annual

Meeting of the American Society for Cell Biology, San Diego, Calif., Nov. 19-21:

"Factors Affecting the Mammalian Cell Cycle" by R. A. Tobey, H-4 (invited)

"Histone Modifications In Vivo: Time-Course in Synchronized Mammalian Cells" by G. R. Shepherd, Billie J. Noland and Julia M. Hardin, all H-4

"Specific Isoleucine Requirements for Initiation of DNA Synthesis and Cell-Cycle Traverse in Various Mammalian Cell Lines" by K. D. Ley and R. A. Tobey, both H-4

"Heparan Sulfate: Biosynthesis in Various Types of Cultured Mammalian Cells" by P. M. Kraemer, H-4

Presentation at colloquium, Department of Physics, University of Wyoming, Laramie, Nov. 23:

"A View Toward the Solar Corona" by D. H. Liebenberg, P-8 (invited)

Presentation at the University of Texas, El Paso, Nov. 23, and New Mexico State University, University Park, Nov. 24:

"Stellar X-Ray Measurements from Vela Satellites" by W. D. Evans, P-4 (invited)

Presentation at the American Physical Society Fall Meeting, New Orleans, La., Nov. 23-25:

"Levels in 122-Antimony from the 121-Antimony (N, Gamma) 122-Antimony Reaction" by E. B. Shera, P-2

"Solar Wind Phenomena" by A. J. Hundhausen, T-12 (invited)

Presentation at Physics Colloquium, Utah State University, Logan, Nov. 30:

"Physics at the Los Alamos Meson Factory" by P. A. M. Gram, MP-6 (invited)

Presentation at 63rd Annual Meeting of the American Institute of Chemical Engineers, Chicago, Ill., Nov. 29-Dec. 3:

"Plutonium-238 Solid Solution Cermet as a Radioisotopic Heat Source Material for Space Applications" by T. K. Keenan, M. W. Shupe, A. W. Nutt, W. C. Pritchard and J. A. Leary, all CMB-11 (invited)

continued on next page

Culled from the January and February, 1951, files of the Santa Fe New Mexican and the Los Alamos Herald by Robert Porton.

Air Raid Signal System Tested

BEEP-BEEP-BEEP-BEEP—That means "air raid" and the Beeping will go on for three minutes. WHOOOOOOO—That means "all clear." These air raid signals were announced to the citizenry by Lloyd C. Kersey, project officer of disaster and defense planning. The warning code is identical with that recently established on a uniform national basis by the Civil Defense Administration in Washington. "The air raid signal will be sounded when Los Alamos officials have been advised by military authorities that an enemy air attack is eminent," Kersey said. Hearing it, persons should take shelter at home, at school or at work. After the all-clear, residents should turn their radio to Station KRSN for instruction.

AEC to Open Nevada Test Site

The Atomic Energy Commission will soon start testing atomic weapons at a site near Las Vegas, Nev. Construction work is already under way at the huge area. Alvin C. Graves, head of the Test Division of the Los Alamos Scientific Laboratory, will be in charge of the technical work at the new site. Scientific and technical personnel for the new experimental projects will be drawn from the consultants and staff of LASL.

Hill Gets New Newspaper

The newspaper world's latest publishing techniques came to Los Alamos this week with the first edition of the Herald. No space for a printing plant is allotted here but the unique use of Teletypesetter and Teletype communications brings the Herald's printing plant in Las Vegas, New Mexico, as close as the next room. The new paper is published by New Mexico Newspapers, Inc. which operates three dailies in this state. The president of the corporation is Lincoln O'Brien and the editor of the Herald is Richard Everett.

Food Sale

Items featured in an advertisement for the White Rock Supermarket: cornflakes, large size, 15 cents; peanut butter, 16 ounce jar, 33 cents; lettuce, 9 cents per pound; sliced bacon, 37 cents a pound; beef roast, 59 cents a pound.

"Plutonium - 238 Radioisotopic Heat Sources for the Artificial Heart Application" by J. A. Leary and L. J. Mullins, both CMB-11 (invited)

Presentation at the Annual Meeting, American Society of Mechanical Engineers, New York City, Nov. 30-Dec. 3:

"The Future of the Heat Pipe" by J. E. Kemme, N-5 (invited)

Presentation at the joint meeting of Southern Nevada Section of the American Nuclear Society and Lake Mead Chapter of Health Physics Society, Las Vegas, Nev., Dec. 1:

"An Introduction to Risk-Benefit Concepts" by H. Otway, J-DOT (invited)

Presentation to the Department of Veterinary Science, University of Florida, Gainesville, Dec. 1:

"The Role of Interferron in Equine Infectious Anemia" by K. D. Ley, H-4 (invited)

Presentation at the Heat Pipe Seminar, NASA Lewis Research Center, Cleveland, Ohio, Dec. 2:

"Review of Heat Pipe Investigations at LASL" by J. E. Kemme, N-5 (invited)

Presentation at Solid Wastes Disposal symposium, Sandia Base, Albuquerque, Dec. 2:

"Experience with Land Fill Disposal of Solid Radioactive Material" by D. D. Meyer and J. W. Enders, both H-1

Presentation at the Institute for Biophysics, Florida State University, Tallahassee, Dec. 2:

"The Role of Isoleucine in Establishment of G_1 Arrest" by K. D. Ley, H-4 (invited)

Presentation at seminars, National Bureau of Standards, Boulder, Colo., Dec. 2; University of Wyoming, Laramie, Dec. 3; and Colorado State University, Ft. Collins, Dec. 4:

"Ultra Low Temperature Nuclear Physics" by J. R. Sites, P-8 (invited)

Presentation at the Southeast-Southwest Regional Meeting, American Chemical Society, New Orleans, La., Dec. 2-4:

"The $H_5O_2^+$ Unit in $HAu(CN)_4 \cdot 2H_2O$" by R. R. Ryan and R. A. Penneman, both CMF-4

"Intracellular Location and Metabolism of Histone fl" by L. R. Gurley, M. D. Enger and R. A. Walters, all H-4

"Syntheses with Highly Enriched Carbon-13: Methanol and Acetic Acid" by D. G. Ott, V. N. Kerr, both H-4, and T. Benziger, GMX-2

"RNA's of Chinese Hamster Cell Post-Ribosomal Particulates" by M. D. Enger, A. G. Saponara, A. E. Hampel and R. A. Walters, all H-4

"Isolation of Histones by Preparative Polyacrylamide Electrophoresis and the Effect of Irradiation on Rapidly Labeled Phosphorus-Containing Fractions" by R. A. Walters and L. R. Gurley, both H-4

"The Crystal Structure of Tridecascandium Decacarbide" by A. L. Bowman, N. H. Krikorian, both CMB-3, G. P. Arnold, P-2, and W. H. Zachariasen, University of Chicago, Ill.

Presentation at the Second Orbiting Solar Observatory Workshop, NASA Goddard Space Flight Center, Greenbelt, Md., Dec. 2-4:

"Monitoring Emission Line Fluxes from Active Regions on the Sun" by H. V. Argo and W. D. Evans, both P-4, and J. A. Bergey, P-1

Presentation at colloquium, University of New Mexico, Albuquerque, Dec. 3:

"Methods of Accurate Cross Section Measurements and Applications in Proton-Plus-Proton and Proton-Plus-Helium-3 Elastic Scattering" by N. Jarmie, P-DOR (invited)

what's doing

PUBLIC SWIMMING: High School Pool—Monday through Wednesday, 7:30 to 9 p.m., Saturday and Sunday, 1 to 6 p.m., Adult Swim Club, Sunday, 7 to 9 p.m.

SIERRA CLUB: Luncheon meeting at noon, first Tuesday of each month, South Mesa Cafeteria. For information call Brant Calkin, 455-2468, Santa Fe.

RIO GRANDE RIVER RUNNERS: Meetings scheduled for noon, second Tuesday of each month at South Mesa Cafeteria. For information call Joan Chellis, 662-3836.

OUTDOOR ASSOCIATION: No charge, open to the public. Contact leaders for information regarding specific hikes.
Jan. 30—Ski area to Sawyer's Hill, Bob Skaggs, 255-2939.
For information on February schedule, call Walter Green, 672-3203.

NEWCOMERS CLUB: Jan. 27, Golf Club (tentative) Social hour, 6:30 p.m.; dinner, 7 p.m.; installation of officers. For reservations call Jane Sherwood, 662-2966.

LOS ALAMOS CONCERT ASSOCIATION: Feb. 1, 8:15 p.m., Civic auditorium: Sergiu Luca, violinist.

LOS ALAMOS FILM SOCIETY: 7:30 p.m., Civic auditorium. Admission: members—$.75, others, $2.
Jan. 27—"Here's Your Life."
Feb. 24—"Wages of Fear."

INTERNATIONAL FOLK DANCING: Every Tuesday, 8 p.m., Recreation Hall. For information contact Don Liska, 662-3665, or Roy Greiner, 672-9961.

MESA PUBLIC LIBRARY:

DISPLAYS

Jan. 5 to Feb. 2—"To Save the Earth," Sierra Club and High School student display
Jan. 5 to Feb. 2—Los Alamos Opera Guild display
Jan. 19 to Feb. 10—"Blocks of Color," oils and/or acrylics, Mrs. Suzedie Clement.
Feb. 3 to March 3—Book display on organic gardening.
Feb. 3 to March 2—New Mexico Heart Association display
Feb. 1 to March 1—Ink drawings of New Mexico, Joan McConnell

SLIDE SHOWS
(7:30 p.m. Mesa Public Library)

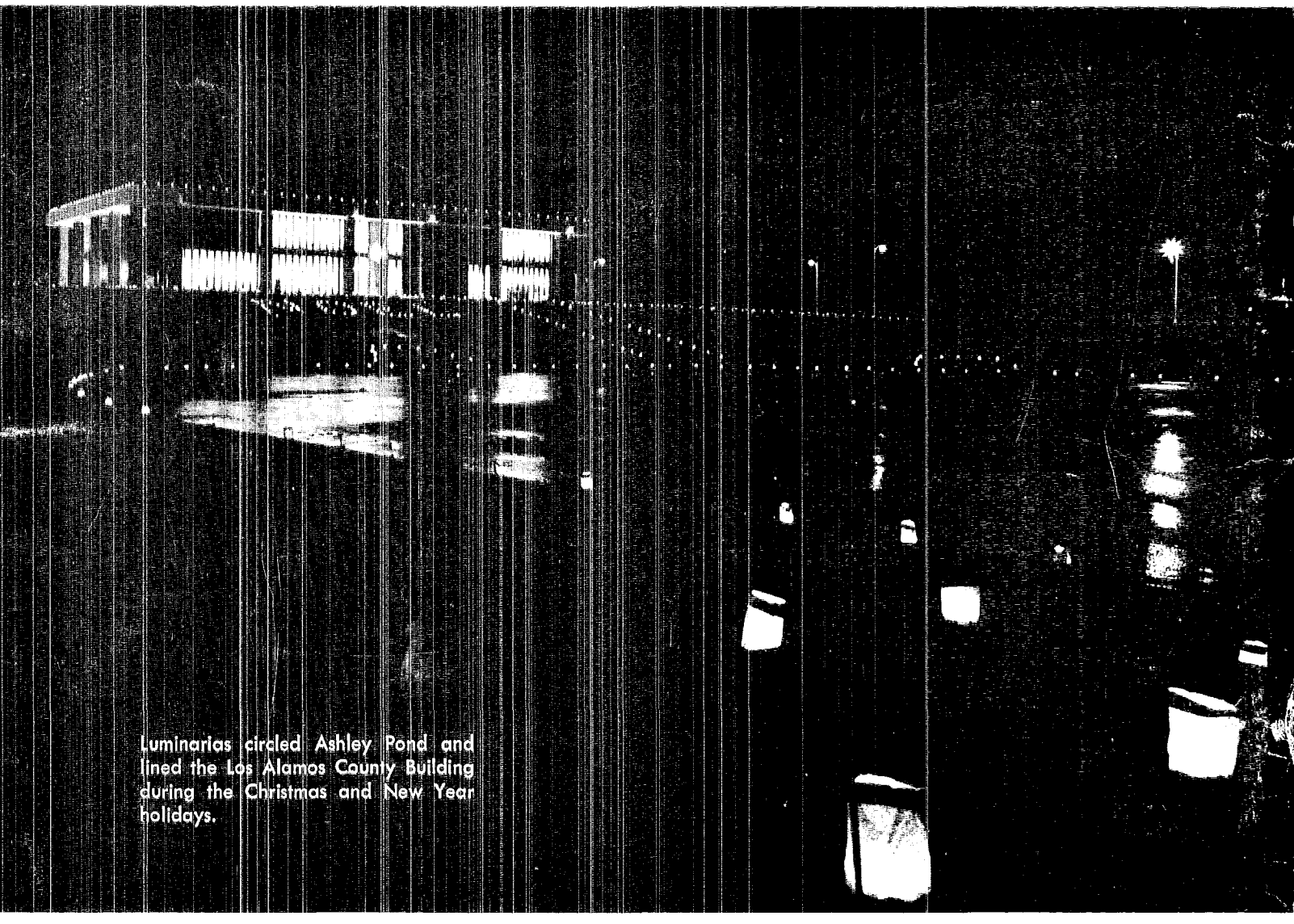
Jan. 19—"Afghanistan," Donald Liska
Feb. 2—"Los Alamos as It Was," Mrs. Philip Koontz
Feb. 16—"Korea," Dr. Roger Gartz

MOUNTAIN MIXERS SQUARE DANCING CLUB: For information call Mrs. Dee Seitz, 662-7356.
Feb. 6—Canyon School, 8 p.m., Bones Craig, caller. Class graduation.
Feb. 20—Canyon School, 8 p.m., Bob Gregg, caller.

ICE SKATING SCHEDULE:
Monday—General skating, 3-5 p.m., and 7-9:30 p.m.
Tuesday—"Mothers and Tots," 9:30-11:30 a.m. General skating, 3-5 p.m.; Figure Skating, 6-7:30 p.m.
Wednesday—"Mothers and Tots," 9:30-11:30 a.m. General skating, 3-5 p.m.; Hockey Club, 7-10 p.m.
Thursday—"Mothers and Tots," 9:30-11:30 a.m. General skating, 3-5 p.m.; Figure Skating Club, 6-7:30 p.m.; adults only, 7:30-10 p.m.
Friday—General skating, 3-5 p.m., and 7-9:30 p.m.
Saturday—Hockey Club, 8:30 a.m. to noon. General skating, 2-4:30 p.m., and 7-9:30 p.m.
Sunday—Individual and group lessons sponsored by the Figure Skating Club, 8 a.m. to 1:30 p.m. General skating, 2-4:30 p.m.; Figure Skating Club, 6-7:30 p.m.; adults only, 7:30-10 p.m.
For information, call 662-4500 during rink hours.

An ice jam on the Rio Grande as far south as Otowi is a rare occurence. But it happened in early January when temperatures dropped below minus 30 degrees. In the background is Black Mesa.

Henry T. Motz
3187 Woodland
Los Alamos, New Mexico 87544



Luminarias circled Ashley Pond and lined the Los Alamos County Building during the Christmas and New Year holidays.